

REMARKS

Claims 1-2, 4-8, 10-14, 21-22, 24 and 26 were previously presented and stand rejected on prior art grounds. Claims 22 and 24 stand rejected upon informalities. Claims 10, 22 and 24 are herein cancelled, as their limitations (or similar limitations) have been amended into their respective independent claims. Thus, claims 1-2, 4-7, 8, 11-14, 21 and 26 are all the claims presently pending in the Applications. The Applicants respectfully traverse the rejections of the claims based on the following discussion.

I. The 35 U.S.C. §112, First Paragraph, Rejection

As mentioned above, the fin limitations of dependent claims 22 and 24 have been amended into independent claims 21. Dependent claims 22 and 24 were rejected under 35 U.S.C. §112, first paragraph, for failing to comply with the written description requirement. Specifically, the Office Action indicated that the “application does not support the claimed screen material comprising fins”. As amended, this fin limitation is not written such that the screen material comprises fins but rather such that the disposable liner comprises fins. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

II. The Prior Art Rejections

Claims 1-2, 4-7, 8, 11-14, 21 and 26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yang, et al. (U.S. Patent No. 5,868,843), hereinafter referred to as Yang, in view of Mahvan, et al. (U.S. Patent No. 5,614,071), hereinafter referred to as Mahvan.

Applicants respectfully traverse these rejections based on the following discussion.

A. Summary Of The Cited Prior Art References And The Present Invention.

Per the Abstract, Yang teaches a detachable sponge device for a spin coating machine used to coat a liquid material over a semiconductor wafer is provided. The detachable sponge device is used to prevent a solvent (that is jetted only on the edge of the wafer to remove a bead of the coating material on the wafer's edge) from being oversprayed elsewhere on the wafer. The detachable sponge device is composed of a curved mounting piece and a corrugated piece of sponge attached on the curved inner side of the mounting piece. The mounting piece can be detachably mounted on the spin coating machine. The corrugated piece of sponge can absorb splattered particles of solvent from the wafer which can thus be prevented from bouncing back onto the wafer.

Per the Abstract, Mahvan teaches a shield for use in a sputtering system. The shield includes a support having an inner expanse defining a two-dimensional array of cavities. The cavities are formed of two-dimensionally concave wall surfaces, where the intersections of the wall surfaces of adjacent cavities form a two-dimensional array of edges on the expanse. The shield minimizes the tendency of material deposited on the shield surface, such as sputtered carbon material, from flaking off during a sputtering operation. Also disclosed is a sputtering assembly that employs the shield.

Like Yang, the present invention similarly provides an apparatus with a shield capable of capturing overspray of a solvent or cleaning fluid from a rotating wafer. However, the present invention is designed not just to capture such overspray, but to prevent the fluid and foreign

matter particles that are ejected from the surface of the wafer from forming a mist and being re-deposited back onto the wafer.

B. Lack Of Suggestion/Motivation To Combine Yang And Mahvan.

The Applicants submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the teachings of Yang and Mahvan. Specifically, it is generally understood that the teaching, suggestion, or motivation to combine references “must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art and that the “test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.” (see *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)). The Applicants submit that a motivation to combine the references is not explicitly or implicitly shown in the references because, while both references teach wafer shields, the purpose and functions of the respective shields (i.e., the natures of the problems to be solved) are significantly different.

Specifically, as discussed above, Yang teaches a corrugated piece of sponge used to absorb splattered solvent from a rotating wafer which can thus be prevented from bouncing back onto the wafer. That is, the shield of Yang is designed *to limit splatter from a fluid directed to the wafer* which is rotated. Mahvan on the other hand teaches a shield for use in a sputtering system that deposits ejected atoms of a material, such as carbon, onto a fixed substrate. The shield has a smooth (as opposed to porous surface) that is used to receive wide-angle deposition

of atoms (e.g., carbon) that are not directed against the target (see col. 1, lines 30-38). In other words the shield of Mahvan is designed to capture overspray that misses the fixed target, not to capture spray that splashes off a rotating target, as in Yang. Additionally, as discussed in detail at col. 4, line 56-col. 5, line 20, Mahvan noted that sputter material deposited on a smooth shield has a tendency to flake off the shield over time as a result of shield buckling in response to global thermal expansion/contraction, when the sputtering shield is heated then cooled. Therefore, the shield structure of Mahvan is designed to minimize flaking by depositing atoms into cavities on the shield surface. These cavities minimize the compressive forces acting on the deposited material.

Given the shields of Yang and Mahvan are designed to shield rotating v. non-rotating substrates, to receive different materials (e.g., fluid vs. atoms), to receive the different material in different manners (i.e., splattering from the wafer vs. direct wide-angle ejection from a sputtering system), to interact differently with the different materials (i.e., absorption vs. deposition) and to solve different problems related to the different materials (i.e., to eliminate immediate back splattering onto the wafer vs. to eliminate flaking into the sputtering plasma overtime), the Applicants submit that the teachings of the cited prior art and the knowledge of one of ordinary skill in the art, as a whole, would not have suggested the desirability of the claimed invention.

In response to the Applicants argument, as set out above, the Office Action provides that “On skilled in the art would have recognized that by surrounding Yang’s shield around the entire substrate, bounce back could be prevented around the entire circumference.” However, the since Yang discloses a directed spray and Mahvan does not there would be not motivation provided in the references to combine the references. That is, the Applicants further submit that Yang

specifically discloses an edge bead rinse device, where the spray nozzle is immediately adjacent to (1 to 2mm from) and direct towards the edge of the wafer (see col. 1, lines 40-45). Yang further discloses that the shield only covers a $\frac{1}{4}$ of the circumference of the shield (an amount sufficient to account for any backsplash from the directed spray) (see col. 3, lines 20-23). Since Yang does not address the problem of atomization (i.e., mist formation) and since the size of the shield of Yang is sufficient to prevent backsplash given the directed spray, there would be no motivation to combine the partial shield features of Yang with the annular shield features of Mahvan.

C. All Claim Limitations Are Not Taught Or Suggested By The Combination of Yang And Mahvan.

The Applicants further submit that neither Yang, nor Mahvan, teach or suggest all of the patentable features of amended independent claims 1, 8 and 21. Specifically, the Applicants submit that the neither Yang, nor Mahvan, teach or suggest the feature in amended independent claim 1 of “wherein a surface of said shield facing said substrate comprises a semi-permeable material adapted to collect said fluid and said foreign matter particles to prevent splashing and further adapted to prevent said fluid and said foreign matter particles from forming into a mist within said apparatus and being re-deposited back on said substrate.” The Applicants further submit that neither Yang, nor Mahvan, teach or suggest the following features in amended independent claim 8: (1) “wherein a surface of said shield facing said semiconductor wafer comprises a semi-permeable absorptive material that collects said cleaning fluid and said foreign matter particles to prevent splashing and” (2) “wherein said surface further comprises absorptive

fins that provide air and fluid flow control such that said surface of said shield further prevents said cleaning fluid and said foreign matter particles from forming into a mist within said cleaning apparatus and being re-deposited back on said semiconductor wafer.” Finally, the Applicants submit that neither Yang, nor Mahvan, teach or suggest the following features in newly added independent claim 21: (1) “a disposable liner on a surface of said shield facing said substrate”; (2) “wherein said disposable liner comprises a perforated material having perforations facing said substrate, said perforated material with said perforations collects said fluid and said foreign matter particles to prevent splashing”; and (3) “wherein said disposable liner further comprises absorptive fins that provide air and fluid flow control such that said disposable liner further prevents said fluid and said foreign matter particles from forming into a mist within said apparatus and being re-deposited back on said substrate.”

As discussed above, Yang teaches a detachable sponge device composed of a curved mounting piece and a corrugated piece of sponge attached to the mounting piece to absorb splattered solvent jetted at the wafer’s edge from bouncing back onto the wafer surface (see Abstract). The present invention identified a problem associated conventional clean stations used to clean the entire surface of the substrate and this problems goes beyond just backsplash to mist formation. That is, the present invention is designed to both collect dispensed fluid and foreign matter particles to prevent splashing and further prevent the fluid and the foreign matter particles from forming into a mist within the apparatus and being re-deposited back on the substrate.

Specifically, during prior art substrate surface cleaning processes, not only is splashing a problem, but additionally a mist of cleaning fluid and foreign matter particles can accumulate

within the shield and cause the foreign matter particles to be re-deposited on the cleaned wafer (see paragraphs [0004]-[0005]). The present invention does not just prevent back splatter problem to which the Yang invention is directed, but also provides a shield lined with a semi-permeable semiconductor material that is particularly adapted (e.g., with fins that control air and fluid flow) to prevent cleaning fluid and foreign matter particles that are ejected from the substrate from forming into such a mist (see paragraphs [0017]-[0018]).

The Applicants respectfully disagree with the assertion in the Office Action that the “adapted to” limitation in claim 1 does not constitute a limitation in any patentable sense (citing *In re Hutchison*, 69 USPQ 138). The Applicants respectfully disagree. There is support for a holding that “adapted to” clauses in claims further limit the claimed subject matter and should not be disregarded (e.g., see *In re Venezia* 530 F.2d 956, 958-59, 189 USPQ 149, 151-52 (CCPA)). Additionally, MPEP§2173.05(g) reiterates that functional language does not render a claim improper. Rather the functional limitation must be evaluated and considered, just like any other limitation, for what it fairly conveys. In this case, not only must the surface of the shield facing the substrate comprise a semi-permeable material adapted to collect fluid and foreign matter particles to prevent splashing, it must further be adapted to prevent the fluid and the foreign matter particles from forming into a mist within the apparatus and being re-deposited back on the substrate, as in independent claim 1.

To this end, independent claim 8 includes the additional limitation of absorptive fins that provide air and fluid flow control such that the surface of the shield further prevents the cleaning fluid and the foreign matter particles from forming into a mist within the cleaning apparatus and being re-deposited back on the semiconductor wafer. Absorptive fins are similarly included in

independent claim 21. The Office Action provides that Yang also teaches “a semi-permeable material (or sponge) having absorptive fins (projections or corrugations) (col. 2 lines 63-65).” The Applicants respectfully disagree. As mentioned above, Yang teaches a detachable sponge device composed of a curved mounting piece and a corrugated piece of sponge. Specifically, the cited portion of Yang provides “a corrugated piece of absorbent material 31, such as sponge, attached on the curved inner side of the mounting piece 32. The corrugated piece of sponge 31 is substantially equal in length to the mounting piece...” The cited portion of Yang does not refer to projections or fins. That is, those skilled in the art would recognize that a corrugated piece of material is not the equivalent of a piece of material having fins. The term “corrugated” is generally understood to mean shaped into parallel folds or grooves (see Dictionary.com Unabridged (v 1.1) Based on the Random House Unabridged Dictionary, © Random House, Inc. 2006.) and the material 31 of Yang is illustrated in Figure 2 as having such parallel grooves. Contrarily, fins are generally understood to mean projections that resemble fins (e.g., a fixed structure 30 projecting outward from the material 12, as illustrated in Figure 3). The sole described function of the corrugated surface is to trap the particles and prevent bounce back to the wafer (see col. 3, lines 27-30). Those skilled in the art would recognize that such a corrugated structure, while suitable for preventing bounce back, would not be sufficient to control air and fluid flow, as the fins in the present invention, so as to prevent mist formation.

Independent claim 21 further includes the additional limitations of a disposable liner on the surface of the shield and that this disposable liner comprises a screen material having perforations facing the substrate. Specifically, as described in paragraphs [0016]-[0017] of the specification, the present invention comprises a shield and the surface of the shield can comprise

a permanent or disposable semi-permeable material, which in turn can comprise, for example, an absorptive material, a screen material, a perforated material etc. Figure 2 illustrates such perforations. Claim 21 reflects an embodiment in which a perforated material, with perforations facing the substrate, is used as a disposable liner for the shield. Neither Yang nor Mahvan teach such a perforated material lining the shield with perforations actually facing the substrate. Perforations are generally understood to mean holes punched or bored through something (see The American Heritage® Dictionary of the English Language, Fourth Edition Copyright © 2006 by Houghton Mifflin Company. Published by Houghton Mifflin Company. All rights reserved.) Again, Yang teaches an absorbent material or sponge, not a material with perforations (i.e., not a material with holes punched or bored through it). Similarly, Mahvan teaches an array of cavities on a wall surface, not a material with perforations (i.e., not a material with holes punched or bored through it).

Therefore, amended independent claims 1, 8 and 21 are patentable over Yang and Mahvan. Further, dependent claims 2, 4-7, 11-14 and 26 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. Moreover, the Applicants note that all claims are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

III. Formal Matters and Conclusion

With respect to the rejections to the claims, the claims have been amended, above, to

overcome these rejections. In view of the foregoing, Applicants submit that claims 1-2, 4-7, 8, 11-14, 21 and 26, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. Therefore, the Examiner is respectfully requested to reconsider and withdraw the rejections to the claims and further to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0456.

Respectfully submitted,

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